Texas Electric Vehicle Infrastructure Plan

Version 0.53 May 20, 2022

This document is a DRAFT version of the National Electric Vehicle Infrastructure Plan for the State of Texas.

It is provided for initial public comment and is NOT FINAL.

Comments can be sent to: txdot_nevi@txdot.gov

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Introduction

The Texas Electric Vehicle (EV) Charging plan is a comprehensive framework to enable passenger EV travel across the state and spur economic development. The network will give Electric Vehicle drivers confidence and flexibility when traveling for work, recreation, or exploration regardless of distance traveled or weather conditions. In accordance with guidance, the plan will focus on interstate routes then transition to off interstate routes and urban areas. The plan was developed in cooperation with the Texas Commission on Environmental Quality, State Energy Conservation Office, Texas Parks and Wildlife, Texas Department of Transportation, the Electric Reliability Council of Texas, Public Utility Commission, Councils of Government, Counties, MPOs, utilities, energy service providers, and advocacy groups in Texas.

TxDOT participated in numerous listening sessions with utilities, grid operators, consultants, fueling station providers, non-profits, and think tanks to better understand the needs, landscape, and trajectory of charging infrastructure in the state.

Recurring themes during listening sessions:

- Adequate power, emphasis to reach 350kW charging as soon as possible
- Competitive bidding process based on merit of proposals
- How to submit proposals
- Amenities at charging locations
- Standardized ports (CCS)
- Identifying profitable locations
- Contracting methods
- EV adoption rates
- Placement of stations in rural/urban areas
- User payment methods
- Data collection and reporting frequency
- Operations and Maintenance / Demand Charges

Initial planning for the network began with the passage of the Infrastructure Investment and Jobs Act (IIJA), Public Law 117-58 (Nov. 15, 2021). In late 2021, TxDOT began internal discussions with planning and legislative staff to understand the law and potential impacts/opportunities. Various scenarios were developed to conceptualize the network and begin the familiarization process on the topic. Early in 2022, existing EV charging stations and corridors from the US Department of Energy Alternative Fuel Data Center were published on the department's Statewide Planning Map to provide a single source of truth for planning, analysis, and education. An EV Dashboard was created to visualize and quantify types of EV charging and track changes over time. In mid-March 2022, TxDOT published 247 EV study areas on the Statewide Planning Map to begin the review and analysis process for industry and interested parties. EV study areas were included in public involvement materials developed by TxDOT and posted to the department's website.

Critical to the Texas EV Charging plan are the Alternative Fuel Corridors. Starting in 2015 and working with planning partners across the state, TxDOT nominated sections of interstate highways to the Electric Alternative Fuel Corridors. In the latest round of nominations (round 6 opened on Feb. 10, 2022), TxDOT took the opportunity to nominate almost all remaining non-business interstate highways as Corridor Pending segments. Detailed descriptions of the nomination process can be found in the Alternative Fuel Corridor section of this document. After round 6 nominations are approved by FHWA, most non-business interstate routes in Texas will be on the Electric Alternative Fuel Corridors network as either Corridor Ready or Corridor Pending. Once approved, the most heavily traveled non-business interstate routes in Texas will be eligible for the National Electric Vehicle Infrastructure (NEVI) program.

FHWA Round 6 - Electric Alternative Fuel Corridor Definitions

Corridor Ready	Corridor Pending
Public DC Fast Charging: • No greater than 50 miles between one station/site and the next on corridor. • No more than 1 mile from Interstate exits or highway intersections along the corridor. • Stations should include four Combined Charging System (CCS) connectors - Type 1 ports (simultaneously charging four electric vehicles). • Site power capability should be no less than 600 kW (supporting at least 150 kW per port simultaneously across 4 ports). • Maximum charge power per DC port should not be below 150 kW.	A strategy/plan and timeline for public DC Fast Charging stations separated by more than 50 miles. Location of station/site- no more than 1 mile from Interstate exits or highway intersections along the corridor.

Dates of State Plan for Electric Vehicle Infrastructure Deployment Development and Adoption

The Texas EV Plan was developed in the spring of 2022, following the initial National Electric Vehicle Infrastructure (NEVI) Formula Program Guidance from FHWA. Upon completion of the plan and submittal to FHWA for review, TxDOT will transition to drafting the solicitation for EV charging stations. The goal is to have the solicitation published by October 1, 2022 (one day after FHWA plan approval deadline).

February - July 2022

- Draft EV Plan
- Public Involvement
- Nominate additional non-business Interstate Highway segments to the Electric Alternative Fuel Corridors
- Texas Electric Vehicle Plan signed by Texas Commission on Environmental Quality (TCEQ), State Energy Conservation Office (SECO), Texas Department of Transportation (TxDOT)

August 1, 2022

- Submit Texas Electric Vehicle Plan to Federal Highway Administration

October 1, 2022

- Publish Solicitation

November – December 2022

- Evaluate Proposals

January 2023

- Award Contract(s) for Stations on Electric Alternative Fuel Corridors

State Agency Coordination

Cross-Agency Coordination

Early in 2022, TxDOT established a cross agency EV Working Group to collaborate on the EV Charging plan. The group met twice a month until plan adoption by TxDOT, SECO, and TCEQ. Members attended regular meetings and contributed to the overall creation, review, and final acceptance of the EV Charging plan.

In March of 2022, TxDOT received a lesson learned briefing from the Texas Commission on Environmental Quality covering their experience administering VW Settlement grants for DC Fast Charging in Texas. This information was used to better understand the difficulties of the task and prepare the workgroup drafting the state EV plan. The main difference between the Texas Volkswagen Environmental Mitigation Program for DC Fast Charging and this plan will be the competitive nature of the proposals. TxDOT will develop a scoring mechanism to evaluate proposals and award contracts that provide the best value to the state. Scoring will be based on cost, quality, capacity, and satisfaction of NEVI guidance (categories are listed for reference, not in order of importance).

Each member of the EV Workgroup contributed to the drafting and review of the EV plan. TxDOT members utilized a shared document for review and editing. EV workgroup members outside TxDOT were emailed documents for their review and editing purposes.

The EV plan reflects close coordination between TxDOT, TCEQ and SECO. Coordination was critical to ensure DC Fast Charging stations developed by VW Settlement funds were included in overall network analysis.

EV Workgroup members:

- Texas Commission on Environmental Quality
- State Energy Conservation Office
- Texas Department of Transportation
- North Central Texas Council of Government (NCTCOG)
- Houston-Galveston Area Council (H-GAC)

Public Engagement

Stakeholders Involved in Plan Development

Following passage of the Bipartisan Infrastructure Bill in November 2021, TxDOT met with private sector companies, utilities, advocacy groups, and other interested parties. Information gathered from these meetings helped inform the plan and guide development of the overall Electric Vehicle Infrastructure program in Texas.

Organization Type	Number of Stakeholders Met With
Advocacy	7
Automotive	1
Civil engineering	4
Construction	5
Consultant	6
Consulting	3
Convenience store	3
EV charging	13
EV-specific utility	1
Government	9
Grid operator	1
Labor union	1
Lobbyist	17
Motor vehicle manufacturing	4
Municipal electric utility	1
National electric and natural gas utility	1
Non-profit research	2
Non-profit think tank	1
Publicly owned utility	2
Renewables and environment	3
Retail	2
Software servicer	5
Trade organization	1
Tribe	3
University research	2
Utility	10
Workforce training and certification	1
Grand Total	**109**

Public Outreach

In a short time, the TxDOT Public Involvement team put together a public involvement plan and resources for the Texas Electric Vehicle Infrastructure Plan. The resources included a landing page for the program, social pinpoint site with surveys, map based public input method for suggested charging locations, social media posts, and a virtual public meeting to discuss the plan. These resources opened a line of communication with the public for the program and input from the public was used to draft the plan. TxDOT will maintain these resources going forward as we develop the program.

Public Involvement Resources:

- Texas Electric Vehicle Infrastructure Plan landing page
- Public Involvement Plan
- Social Pinpoint Site

Public Involvement Results (as of May 5, 2022)

Public Involvement Method	Count
Unique Webpage Visitors	1,698
Webpage Visits	2,460
Webpage Views	2,794
Facebook Views	
Facebook Comments	23
Facebook Likes	30
Facebook Laughs	9
Facebook Dislikes	5
Facebook Shares	6
Twitter Views	
Twitter Likes	4
Twitter Retweets	3
Twitter Comments	1
Completed Surveys	133
Emails to TxDOT_NEVI@txdot.gov	21
Map Comments	27
Map Charging Location Suggestions	54

Plan Vision and Goals

Plan Vision

The Statewide EV plan for Texas is a multi-year plan to enable current and future drivers of electric vehicles to confidently travel across the state for work, recreation, and exploration. One measure of success of the plan for Electric Alternative Fuel Corridors will be how well it meets FHWA requirements of 50-mile spacing for DC Fast Chargers, 1 mile from the interstate exit, rated at 150kW. The same power and minimum unit requirements will be applied to stations at or near County Seats but since most County Seats are not on the Alternative Fuel Corridors the minimum spacing requirements do not apply. Spacing off the corridors could be slightly greater (70 miles) in rural counties due to distances between population centers and electrical supply lines in west Texas. Large urban areas will utilize a combination of DC and Level II charging across their respective areas. The mix and location of chargers will be determined based on equipment cost, access to power, community identified needs, and how long a vehicle is parked.

General execution of the plan:

- Expand Electric Alternative Fuel Corridors to include almost all non-business Interstate routes.
- Work with the private sector to install DC Fast Charge stations along Electric Alternative Fuel Corridors according to FHWA requirements.
- Work with Metropolitan Planning Organizations to identify suitable locations to install a combination of Level II and DC Fast Charging infrastructure inside large urban areas.
- Work with rural counties and small urban areas to install DC Fast Charge stations at or near county seats across the state.
- Collect data from the network to assess usage and identify trends for future development

High level goals of the EV Charging Network

Redundancy – The density, distribution, and power of the EV network outlined in this plan is targeted to support 1 million electric vehicles when built out (see page 22 for EV estimates). DC Fast charging stations will be 50 miles apart on the Electric Alternative Fuel Corridors and usually 70 miles apart anywhere else in the state. Drivers will have multiple options for EV Charging along their intended travel route. Each location will have at least four units with pull through spaces for passenger vehicles pulling trailers or recreational vehicles. When drivers arrive at a location with four or more units, it is likely a stall will be available even if several units are occupied, down for maintenance, or otherwise unavailable. Locations will be discoverable online at the US Department of Energy Alternative Fuel Data Center and various third-party applications.

Adequate power – Each individual charging unit on the Alternative Fuel Corridors will be rated to deliver at least 150kW of power to the vehicle (4-unit installations would require 600kW per site and scale up proportionally from there). In some cases, the maximum power provided could be higher if supply and costs for that power are not excessively high. In most cases 150kW power can recharge a vehicle from 10% to 80% in about 30 minutes. Charging speeds will vary by manufacturer, equipment installed on the vehicle, and battery characteristics like age and temperature.

Pull-through capability – Each DC Fast Charge station on the Alternative Fuel Corridors or near county seats will have at least one pull-through space for vehicles pulling trailers or RV campers. Locations will not include spaces for freight trucks or trailers. Freight charging will be addressed pending guidance from FHWA in the fall of 2022.

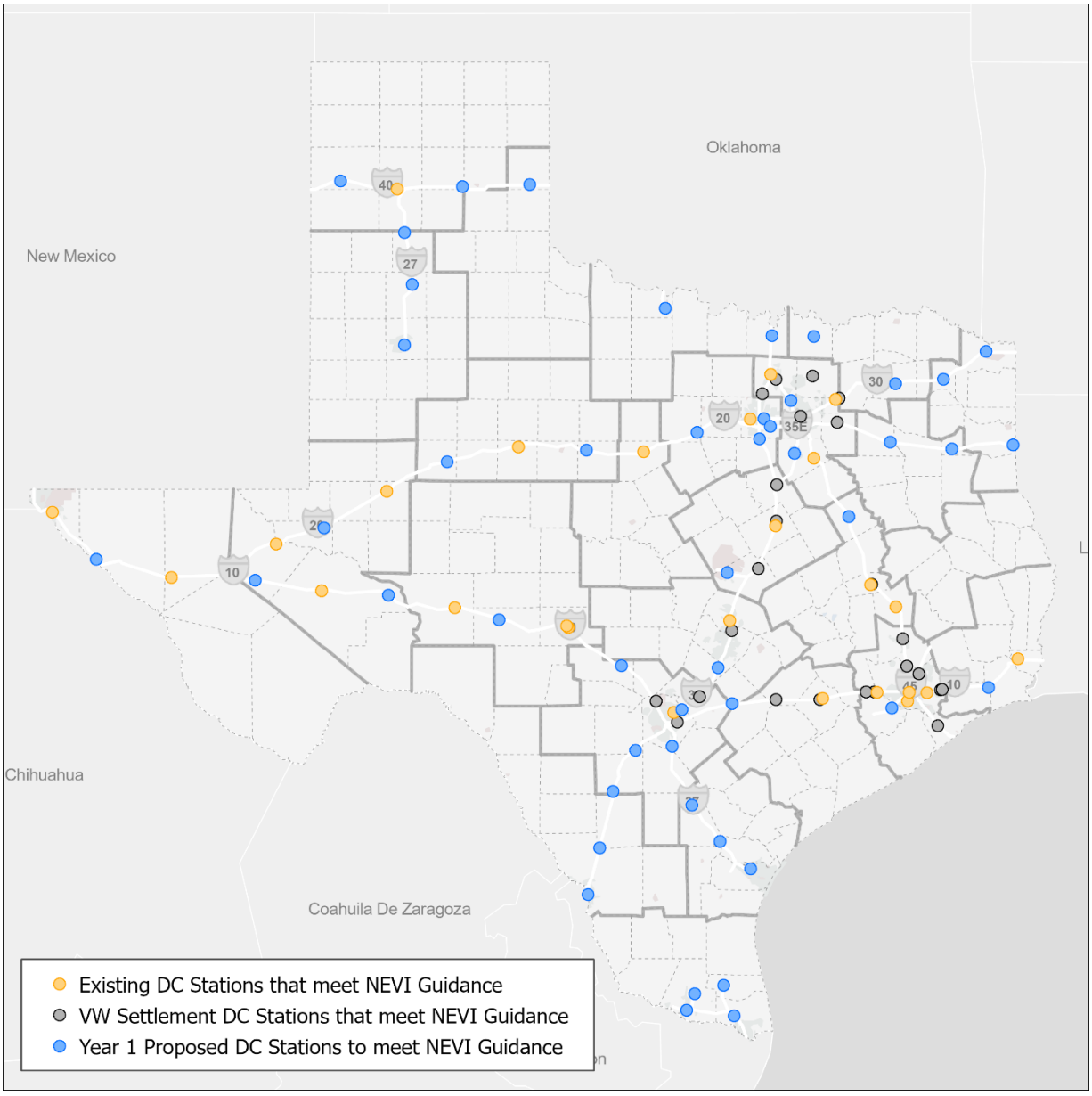
Standardization – Per FHWA requirements for DC Fast Charge stations on Alternative Fuel Corridors, a minimum of 4 CCS ports will be available at each location. Stations at or near county seats are expected to have a minimum of 4 CCS ports but conditions in the area will ultimately determine the number of ports. Cable length will be standardized to accommodate vehicles with charge ports in various vehicle locations. Stations will have adequate lighting, signage, and instructions for station usage and reporting inoperable stations.

Education – Outreach materials will be developed to educate the public on good charging habits, station location, station usage, equipment capability, and how to provide feedback on the network.

Evaluation – As required by guidance, TxDOT will develop a framework to collect and evaluate station usage information from equipment owners and adjust the network as needed based on this information.

Charging Network Timeline

Year one will focus on building out the Electric Alternative Fuel Corridors to meet FHWA guidance. This will include rapid re-evaluation of the network to assess private sector development outside the National Electric Vehicle Infrastructure (NEVI) program. Approximately 48 new locations will be needed to satisfy the 50-mile maximum spacing requirements from FHWA. The 48 new locations will complement 27 existing locations installed by the private sector and 26 planned locations resulting from VW settlement grants that meet FHWA requirements. A full list of Electric Alternative Fuel Corridors and Stations can be found in the Existing and Future Conditions section of this document.



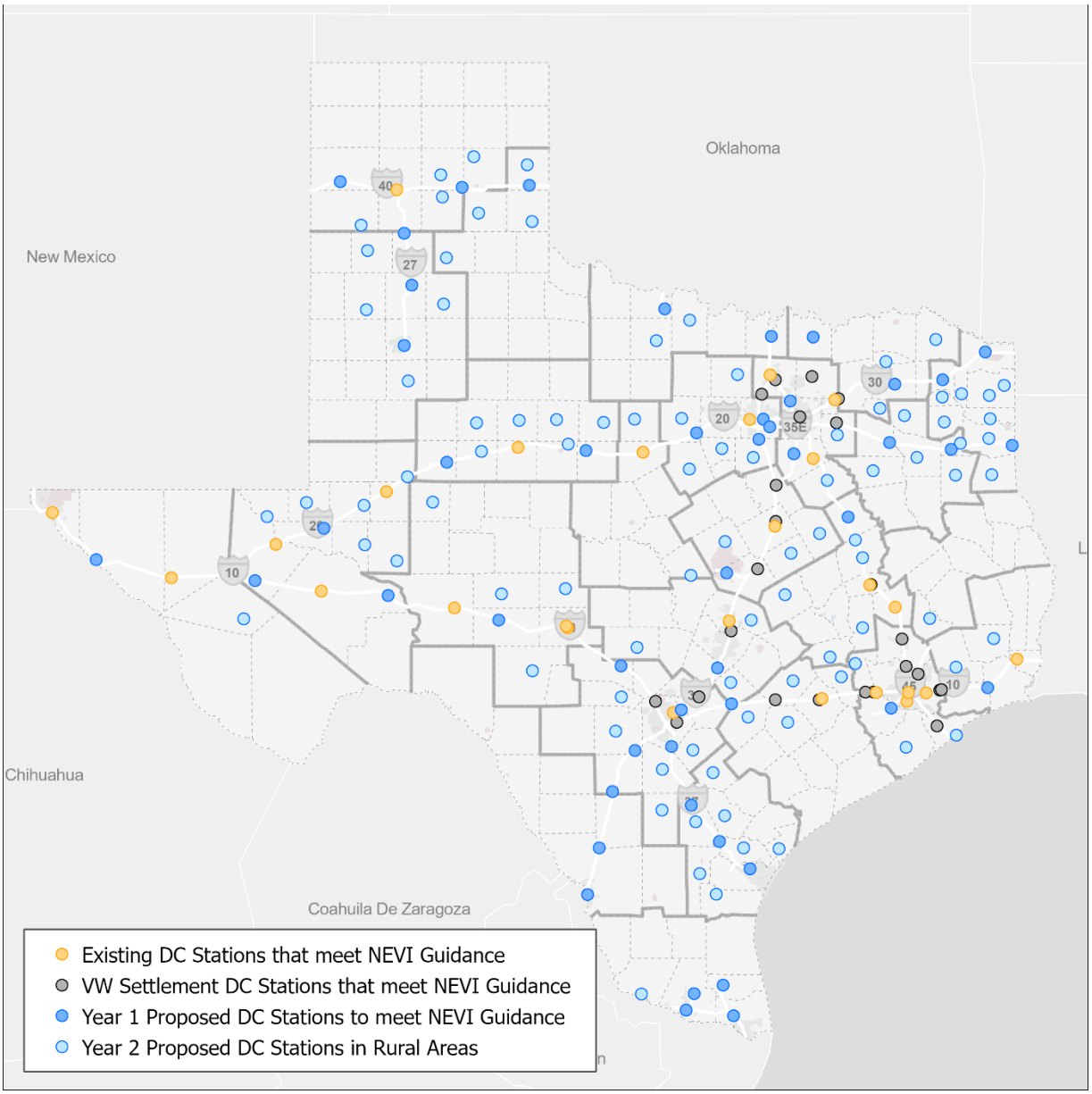
Year two (or after Electric Alt Fuel Corridors are completed) will focus on rural counties, small urban areas, and MPOs. TxDOT will utilize a modified formula from our Unified Transportation Program to estimate funds for EV Charging inside MPOs. Large urban areas will require a combination of Level II charging and DC Fast Charging dependent on the time a vehicle is parked at a location. If a vehicle is parked at a location less than 2 hours a 50kW DC station is recommended. From 2 to 9 hours a Level II station is recommended. Level I stations are recommended for multiday parking situations like airports. Ultimately, placement decisions and power ratings will be proposed by the MPOs.

In rural areas the focus will be installing DC Fast Charging stations at or near County Seats. County seats are usually centrally located in the county (all roads lead to the county courthouse) and provide good spacing between urban clusters in rural areas. Vehicle Miles Traveled (VMT) will be used to establish a priority list of most traveled non-interstate routes through rural areas. Installing DC Fast Charge stations at county seats with a power rating of 150kW and minimum four units will fill gaps across rural Texas for off-interstate travelers and enable local farm and work trucks to access the charging network.

Multiple vendors could be engaged to complete the work and TxDOT will balance contractual agreements to ensure rural and urban areas are represented and progress at an equal rate.

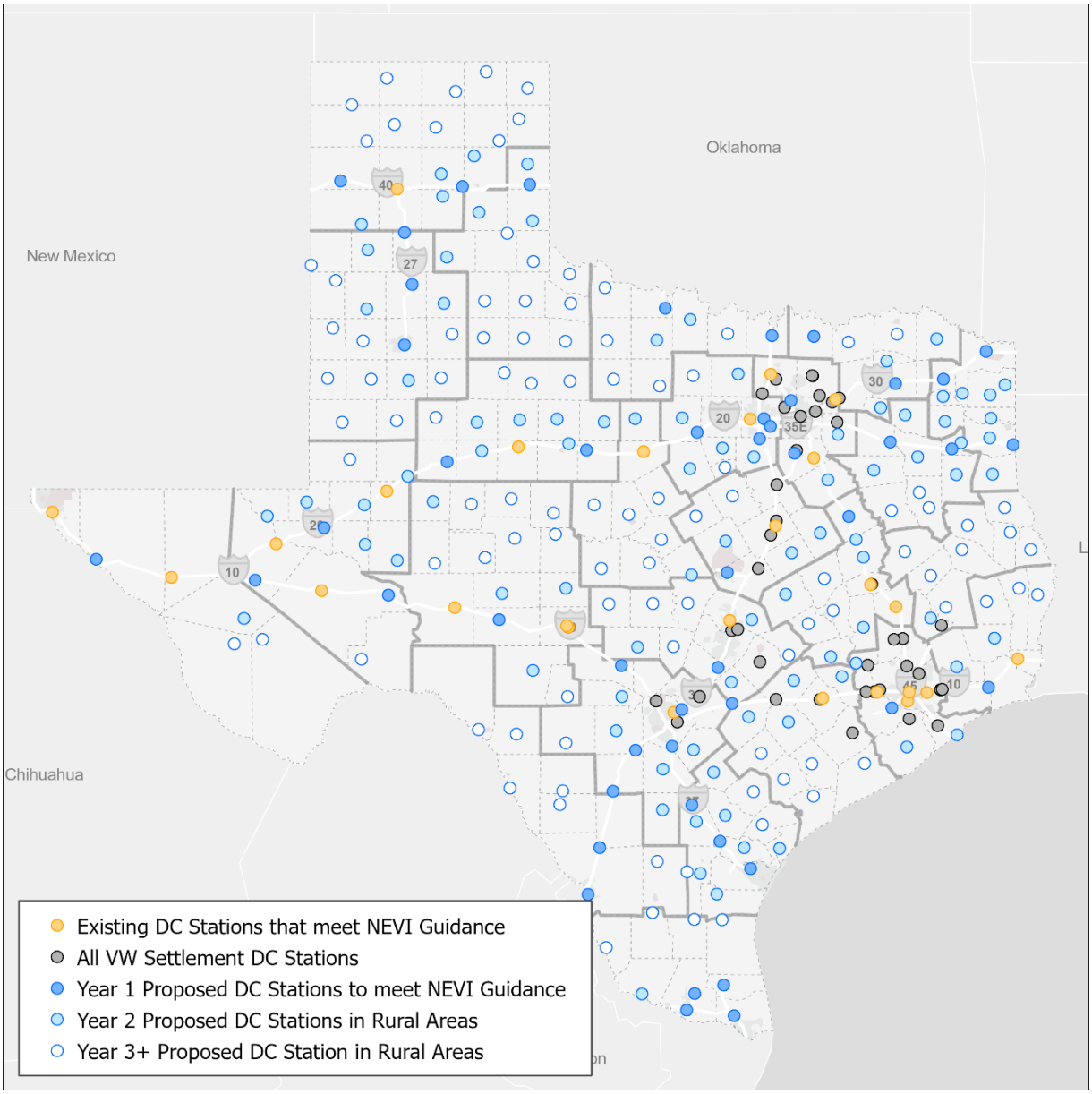
Year two map on following page.

Year two map is for illustration purposes only, the order of deployment has not been determined.



Years three, four, and five continue the work of building out charging infrastructure inside rural counties, small urban areas, and MPOs. Statewide coverage will improve, and the network will progress into more rural areas of the state. As the charging network spreads to more rural areas the equipment installed may adjust to accommodate varying power supply in the region. A combination of solar/battery equipment may be placed between the charging equipment and the power grid to minimize demand charges and ensure adequate power for 4 units rated at 150kW per unit.

As with year two, multiple vendors could be engaged to complete the work and TxDOT will balance contractual agreements to ensure rural and urban areas are represented and progress at an equal rate.



Contracting

TxDOT will contract with private sector entities on a competitive basis to develop EV charging stations across the state. A solicitation with standards and expectations will be developed to collect, evaluate, and award contracts. Contracting language will include all federal requirements and guidelines.

The selected vendor will work to identify specific installation sites within TxDOT identified EV Study Areas and work with property owners, utilities, and municipalities to complete the installation. The vendor will be responsible for all federal requirements and guidelines and working with TxDOT on environmental clearance. It is anticipated that EV Study Areas could shift/expand during the siting process to better meet FHWA requirements.

Language will be added to the contract to outline 5 years of operations and maintenance as needed per location. Language will also be added to handle ownership/operations issues after the 5-year operation and maintenance assistance ends. This will ensure another operator can be located/contracted to keep the station open and accessible to the public.

Solicitation will have two creation/approval tracks for charging stations depending on whether the location is inside or outside an MPO.

- Alternative Fuel Corridor or Non-Alternative Fuel Corridor Outside an MPO
    - TxDOT determines charging station types and general locations
    - TxDOT drafts solicitation
    - TxDOT scores responses
    - TxDOT awards
    - Vendor(s) begin siting, permits, environmental clearance, installation, and operation
    - TxDOT manages until completion
    - TxDOT monitors usage over time
- Inside MPOs
    - TxDOT/MPO propose charging station types and general locations
    - TxDOT/MPO draft solicitation
    - TxDOT/MPO scores responses
    - TxDOT awards
    - MPO updates TIP (group projects to avoid tip updates for individual stations)
    - Vendor(s) begin siting, permits, environmental clearance, installation, and operation
    - TxDOT manages until completion
    - TxDOT monitors usage over time

Buy America

In April 2022, the Office of Management and Budget (OMB) released a memo, directed at federal agencies titled, "Initial Implementation Guidance on Application of Buy America Preference in Federal Financial Assistance Programs for Infrastructure." In part, the memo reads, "This guidance applies to all Federal financial assistance… whether or not funded through IIJA—where funds are appropriated or otherwise made available and used for a project for infrastructure." "Federal financial assistance" refers to aid that non-federal organizations (for example, states or local governments) receive or administer in the form of cooperative agreements, grants, donations of property, loans, etc. In that light, TxDOT will adhere to Buy America requirements issued for NEVI. TxDOT understands that FHWA has continued to interpret and apply Buy America requirements based on a 100% domestic content and domestic assembly threshold for iron, steel, and protective coatings, save for a de minimis threshold of $2,500 or one-tenth of one percent of the total value of the contract, whichever is greater. TxDOT notes that other agencies under USDOT have more flexible/workable definitions of Buy America compliance. While TxDOT hopes for a more flexible definition than what FHWA has implemented to date, or for reasonable allowance of waivers, the agency is prepared to adhere to whatever requirements FHWA issues, both in the initial April 2022 guidance and beyond. It should be noted, however, that the stricter the requirements are, the greater the risk to prompt deployment due to limited equipment availability and/or supply chain concerns.

Existing and Future Conditions Analysis

Current EV Ownership in Texas

125,418 electric vehicles are registered in the state of Texas as of May 3, 2022. Of the 254 counties across Texas, there are electric vehicles registered in 233 counties. Registered EV distribution is 73.8% Battery Electric and 26.2% Plug-In Hybrid Electric. Non-Tesla vehicle models make up nearly half of all EVs registered across the state. Also, over a quarter of electric vehicles are 2021 models. Electric vehicles currently constitute under 1% of all vehicles registered in Texas. However, since 2020, the total number of electric vehicles across Texas has nearly tripled as more people adopt the technology. With rapidly growing adoption rates, it is necessary to ensure Texas will be able to meet the demand of these new vehicles on the road. For EV registration data, visit the North Central Texas Council of Governments EV Registration tools at www.dfwcleancities.org/evnt.

Current and Future temperature and precipitation

Texas experiences a wide range of temperatures and extreme weather events, including ice and snowstorms, tornados, hurricanes and tropical storms, and wildfires in dry conditions. Performance during extreme weather events is important, particularly when we anticipate it will affect infrastructure such as power and communications outages, etc. We learned during the February 2021 winter storm that not all electric grids are fully resilient under some conditions. Charging stations need to be reliable for continued travel, and ready to help the public evacuate from extreme conditions, especially in remote areas. We will include the need to plan for emergencies in choosing the sites for charging stations. Keeping stations near interchanges and crossroads that are easily accessible, suitable commercial or public sites, adequate power aligned to priority grid capabilities, communications and security are all considerations not only for operational feasibility, but also to support the public in extreme conditions. Below we identify our general climate conditions. Later in the plan we provide early thoughts on resiliency risk reducing actions, and the need for physical and cyber security.

Current and future temperature and precipitation patterns provided by John Nielsen-Gammon, Texas State Climatologist, Texas A&M University.

Texas has a warm climate, with hot summers throughout the state, mild winters in southern Texas, and cooler winters in northern Texas. Normal July maximum temperatures are typically above 90 °F, while average January minimum temperatures vary from the 20s °F in the north to the 40s and 50s °F in the south. All present-day climate statistics are based on the standard normals period of 1991-2020 unless otherwise noted.

The number of days in which the temperature reaches 100 °F is less than once per year (fewer than thirty times in thirty years) along the Gulf Coast and mountains in West Texas. Most of the state sees on average between 5 and 20 100 °F days per year. More than 30 100°F days per year are common in western portions of South Texas and along the Rio Grande and Pecos River in West Texas. Days reaching 110 °F are extremely rare, with frequencies of once per year found only in West Texas along the Rio Grande and Pecos River and near Childress in northwestern Texas.

The period 1991-2020 was unusual in Texas for the absence of extreme cold compared to the 1980s and 2021-2022. To obtain more representative statistics, extreme cold is examined for the 41-year period 1981-2021. Temperatures drop below freezing less than once per year along the Texas coast and westward to the Laredo area, while in the Panhandle over 90 days per year have temperatures below freezing. Below-zero (°F) temperatures did not occur at all in the southern half of the state, while the extreme northern Panhandle averaged two per year.

Normal annual precipitation varies dramatically from west to east across the state. Low-altitude far western locations, such as El Paso, average less than 10 inches per year, while the southeast corner of the state near Beaumont averages over 60 inches per year. Heavy rain is common in southeast Texas and rare in west Texas. Much of western Texas did not experience a single day with more than 5 inches of rainfall during 1991-2020, while for the Houston and Beaumont areas it was almost an annual occurrence.

Measurable snow is extremely rare at the southern end of the state and quite common at the northern end. Typical annual snowfall totals during 1890-2021 were less than 3 inches in the southern half of the state and over 8 inches in the Panhandle.

According to CMIP6 global climate model simulations and recent historical observations, Texas temperatures may be expected to increase by about 1.25 °F for every 1 °F of global temperature increase, with the relative increase smallest along the coast. If global temperatures increase by an additional 2 °F, which the IPCC assesses could happen in some scenarios around the middle of the 21st century, it could double the number of 100 °F days in most areas of the state and could make 110 °F days considerably more common. The number of extremely cold days could decrease slightly.

Precipitation over the past century has had little trend in western Texas but has increased by about 15% in eastern Texas. Global climate model projections are mixed, with the overall model consensus being a slight decrease in annual precipitation. Rainfall intensity during the wettest days of the year has increased across the state by an average of about 10-15% and is expected to continue increasing at a rate of about 3-4% per 1°F of global rise in temperature. Snow frequency and intensity is expected to decrease, because the amount and frequency of snow in Texas is limited by the frequency of below-freezing temperatures during wintertime storm events.

EV Adoption and Market Conditions

The Electric Reliability Council of Texas (ERCOT) estimates there will be 1 million electric vehicles on the road in Texas by 2028. Using current growth trends for EVs the Texas Department of Motor Vehicles estimates Texas will reach 1 million EVs by 2031. As part of the network evaluation process in this plan TxDOT will monitor the adoption rate of EVs in Texas and adjust/develop the network going forward.

The production of battery electric vehicles is increasing in the US with notable developments in Texas. Likewise major automakers are rapidly developing battery production capacity in the US to electrify their vehicle lineups.

Existing and planned battery factories in the US:

Owner/Operator	Location	Annual Capacity	Planned Year
Tesla/Panasonic	Sparks, NV	38 GWH	2022
Tesla	Fremont, CA	10 GWH	2022
Tesla	Austin, TX	100 GWH	2022 +
GM/LG	Lordstown, OH	30-35 GWH	2022
GM/LG	Spring Hill, TN	30-35 GWH	2023
GM/LG	Lansing, MI	5 GWH	2022/2023
Ford	Memphis, TN	43 GWH	2025
Ford/SK Innovation	Kentucky	86 GWH	2025
Stellantis/LG	Windsor, Ontario	45 GWH	2025
Stellantis/Samsung SDI	TBD	TBD	2026
SK Innovation	Atlanta, GA	21.5 GWH	2023
Toyota	Greensboro, NC	200,000 vehicles	2025
Volkswagen	Chattanooga, TN	TBD	TBD
Mercedes/Envision	Bibb County, AL	TBD	2024
Various Manufacturers	VA	80 GWH	2022 +
1 GWH = 13,000 electric vehicles with a battery pack capacity of 77 kWH			
Annual Capacity refers to the yearly output of battery capacity produced at each factory			

Grid Capacity and Considerations

Texas has been an energy leader for many years with strong growth in wind generation since 2000 and more recently from solar generation. In 2006, Texas became the #1 state for wind power and is now showing similar rapid growth in solar power. Short-term ERCOT projections show these trends accelerating at least through 2024.

The document titled "Report on the Capacity, Demand and Reserves (CDR) in the ERCOT Region, 2022-2031" published by ERCOT provides power generation estimates from 2022 – 2031. The first 5 years are displayed in the table below.

	2022	2023	2024	2025	2026
Firm Peak Load	74,977 MW	76,542 MW	77,767 MW	78,795 MW	79,819 MW
Total Capacity	92,884 MW	106,684 MW	110,179 MW	110,521 MW	110,683 MW
Reserve Margin	23.9%	39.4%	41.7%	40.3%	38.7%

Theoretical max energy consumption of the EV Charging Network outlined in this plan is 605.8 MW (see page 37 for details).

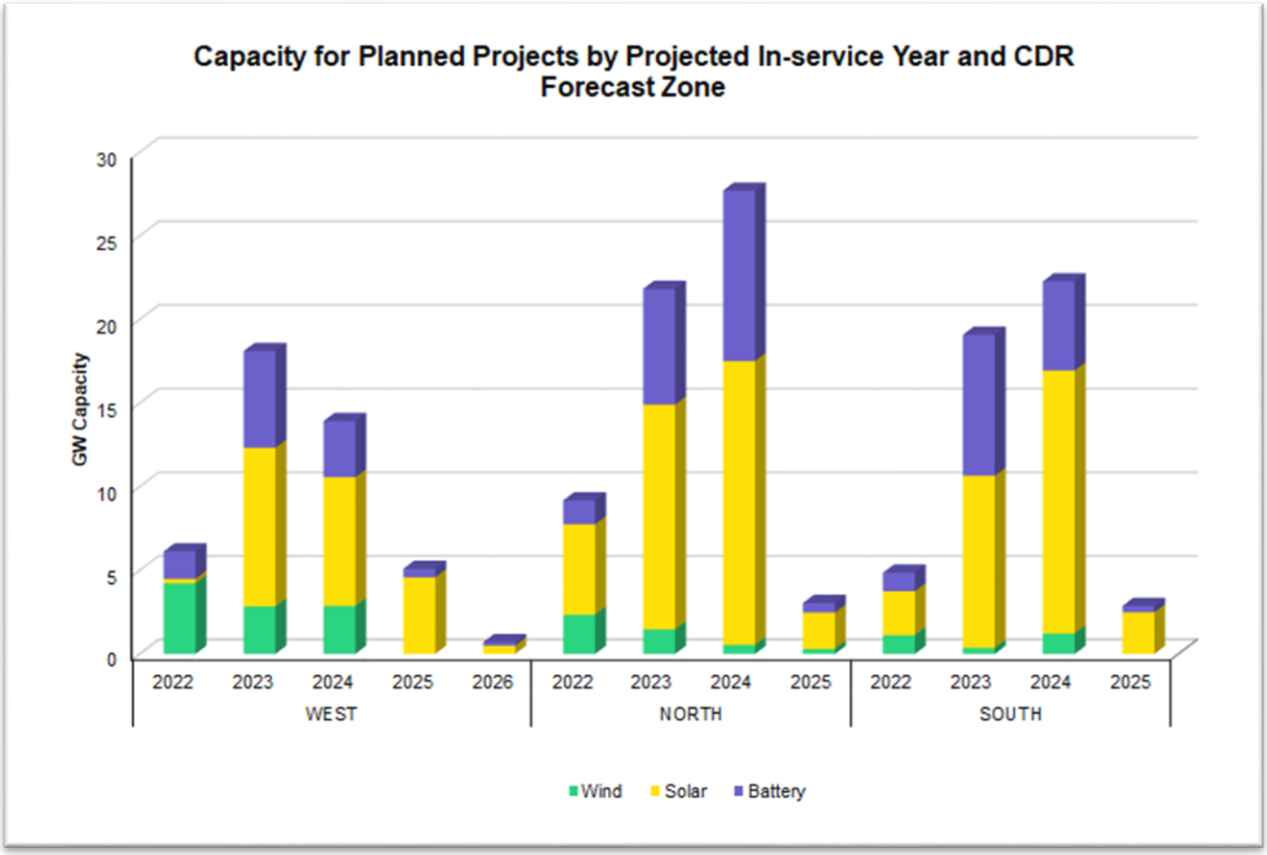
The newest and rapidly growing "source" on the Texas grids is battery storage, breaking 500MW in 2021. Appropriately sited battery storage could reduce variability and congestion issues. More detail can be seen in the image below from the February 2022 Generator Interconnection Status report provided by ERCOT.

Texas is a unique state in the number and variety of grids to be considered, spanning all three major grids in the contiguous USA.

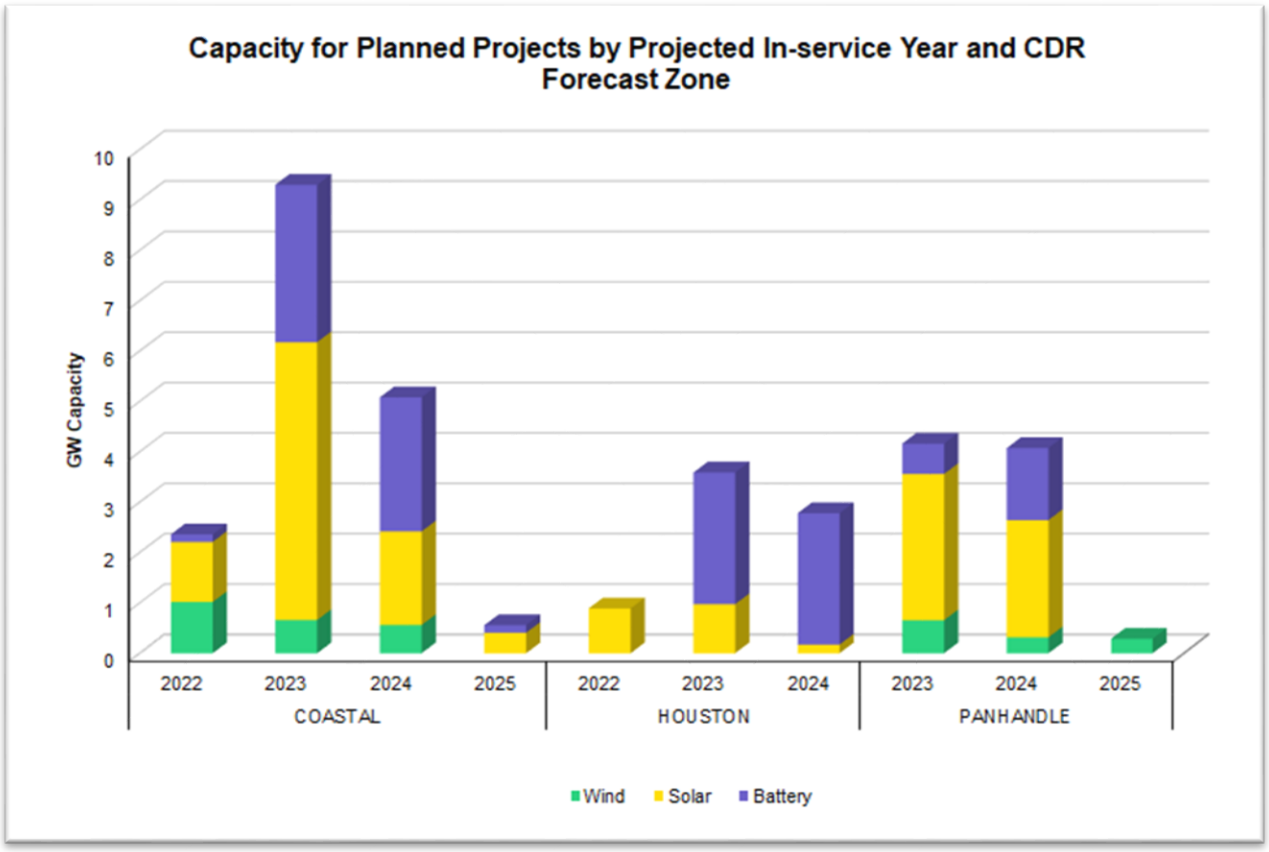
1. ERCOT is fully contained within Texas and services about 90% of electrical demand. ERCOT is quite isolated with a few minor connections to the Eastern Interconnect and to Mexico, typically representing around 0.25% of annual net ERCOT electricity.
2. Portions of West Texas are serviced by the Western Interconnect, the portion in Texas by El Paso Electric.
3. Portions of East and North Texas are serviced by two separate Independent System Operators (ISOs) within the Eastern Interconnect- the Southwest Power Pool (SPP) and the Midcontinent ISO (MISO).
4. NOTE: the Lubbock area is in transition from the Southwest Power Pool to ERCOT.

Forecast new installations by year of Wind, Solar, and Battery capacity from the ERCOT Generator Interconnection Status Report May 2, 2022 (with and without interconnection agreements or full interconnection studies)

Forecast new capacity for West, North, and South regions



Forecast new capacity for Coastal, Houston, and Panhandle regions



State Geography, Terrain, Climate and Land Use Patterns

Texas enjoys varied geography across vast distances from the coastal Barrier Islands along the Gulf of Mexico to the Franklin Mountains in El Paso. Each region has its own unique properties and flair that distinguishes itself from equally stunning far-flung reaches of the state. The transportation system is the backbone of the state carrying people and goods between sea and inland ports, agricultural regions, energy sectors, and metropolitan areas. Varied terrain and geography are not a deterrent to travel as Texans move about the state year-round.

Population continues to grow with the majority estimated to occur inside large metro areas. Vehicle miles traveled are expected to rebound following the pandemic as Texans return to traditional travel patterns. The transportation system in Texas will continue to connect people and places in the most remote regions of the state. The addition of infrastructure under the NEVI program will enhance the travel experience and provide options for future growth and development in Texas.

See the Current and Future temperature and precipitation sub section in the Existing and Future Conditions Analysis Section for the Climate summary.

State Travel Patterns, Public Transportation Needs, Freight and Other Supply Chain Needs

Texas has over 3,400 centerline miles of interstate highways, and interstates represent the largest percentage of vehicle miles traveled in the state. TxDOT agrees focusing on Electric Alternative Fuel Corridors and the interstate highways first is the best way to build out a statewide charging network. We look forward to guidance from FHWA on freight and heavy-duty vehicles.

FHWA guidance recommended a minimum of 4 units rated at 150kW per unit. However, in this plan each location can have up to 8 units per location depending on traffic volume, urban area size, and special considerations like evacuation routes.

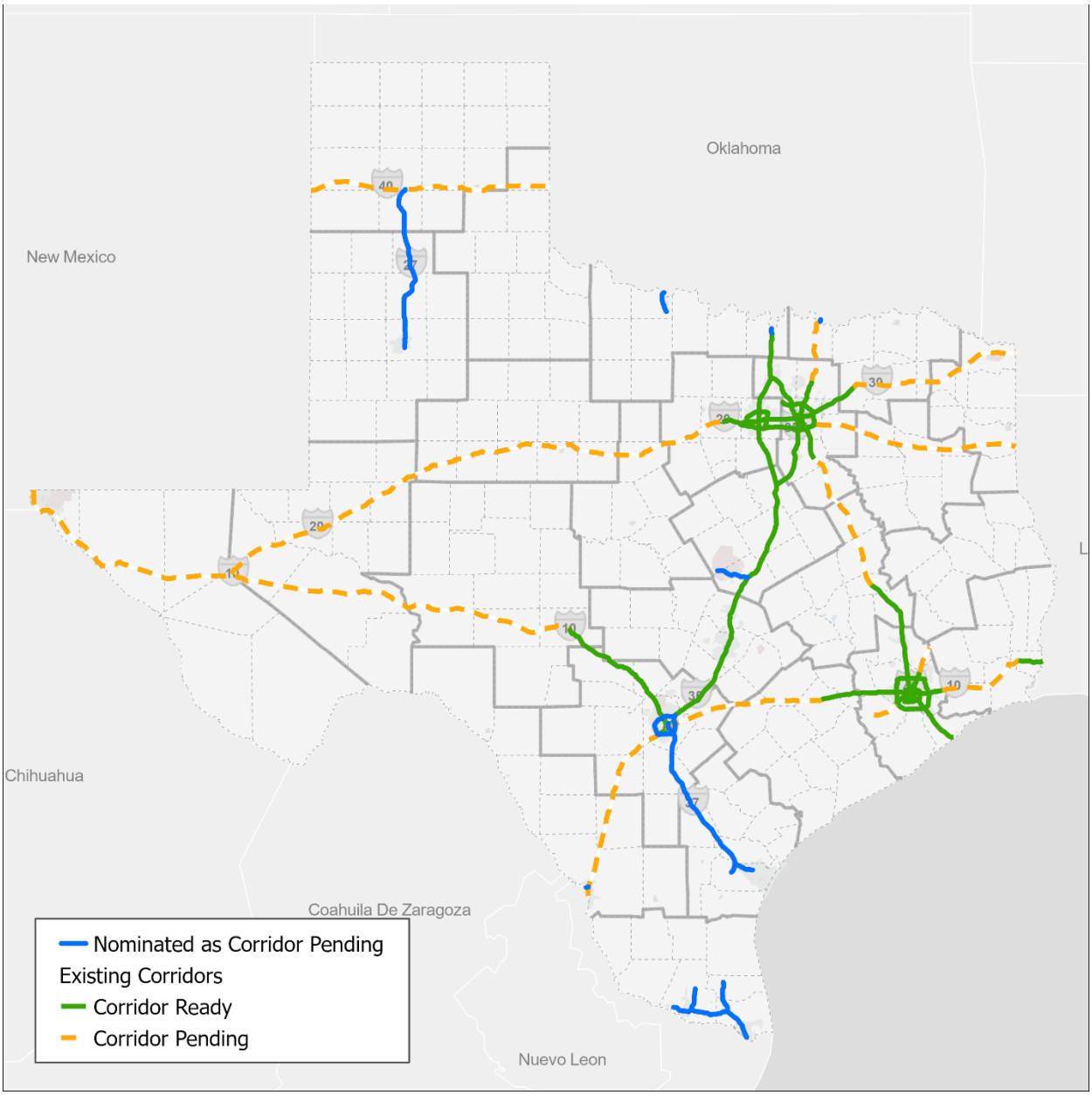
The ongoing equipment, labor, precious metals, and microchip shortages have the potential to lengthen timelines and limit private sector capabilities. TxDOT acknowledges the difficulties brought on by these situations and will do our best to work with vendors and planning partners to complete the network/installation process as soon as possible.

Alternative Fuel Corridor - Corridor Networks

TxDOT nominated segments in the table below to the Electric Alternative Fuel Corridors as Corridor Pending. Each segment lacks sufficient infrastructure to be considered Ready. However, as part of the NEVI grant and formula programs, we believe the corridors will rapidly develop to meet Corridor Ready requirements. The Texas EV Plan prioritizes existing Electric Alternative Fuel Corridors and nominated electric segments below to meet Corridor Ready requirements in the future. Nominations bring all non-business interstate routes to Corridor Pending status for the electric fuel type. A small number of US route nominations are included to bridge connectivity gaps at the border. Consideration for activities in adjoining states are included in anticipation of and complimentary to EV plans for interstate travel. Finally, nominations provide connectivity for almost all MPOs in Texas. Connectivity to remaining MPOs (San Angelo, Bryan-College Station, and Victoria) will be evaluated during the next round of nominations or after the Electric Alt Fuel Corridors are built out.

ID	State	Fuel	Corridor Pending – Nominations Round 6
1	Texas	Electric	IH0002 - Entirety of Route IH0014 - Entirety of Route IH0027 - Entirety of Route IH0035 – From FM1202 to Oklahoma border IH0037 - Entirety of Route IH0044 - Entirety of Route IH0069W - From River Bank Rd. to .352 miles west of IH0035 IH0069C - From IH0002 to FM0490 IH0069E - From SS0425 near Mexican border to US0077W/Conley Rd. IH0069E - From IH0037 to .419 miles west of FM0892 IH0410 - Entirety of Route US0069 - From US0075/US0069 intersection to the Oklahoma border

Round 6 Electric – Alternative Fuel Corridor Nomination Map



Existing Locations of Charging Infrastructure Along AFCs

TxDOT utilized station location information from the US Department of Energy Alternative Fuel Data Center to identify private sector charging stations that met FHWA round 6 guidance. TxDOT will continue to re-evaluate private sector charging stations as the program evolves.

Existing DC Fast Charge Stations as of April 6, 2022 (source: Alternative Fuel Data Center):

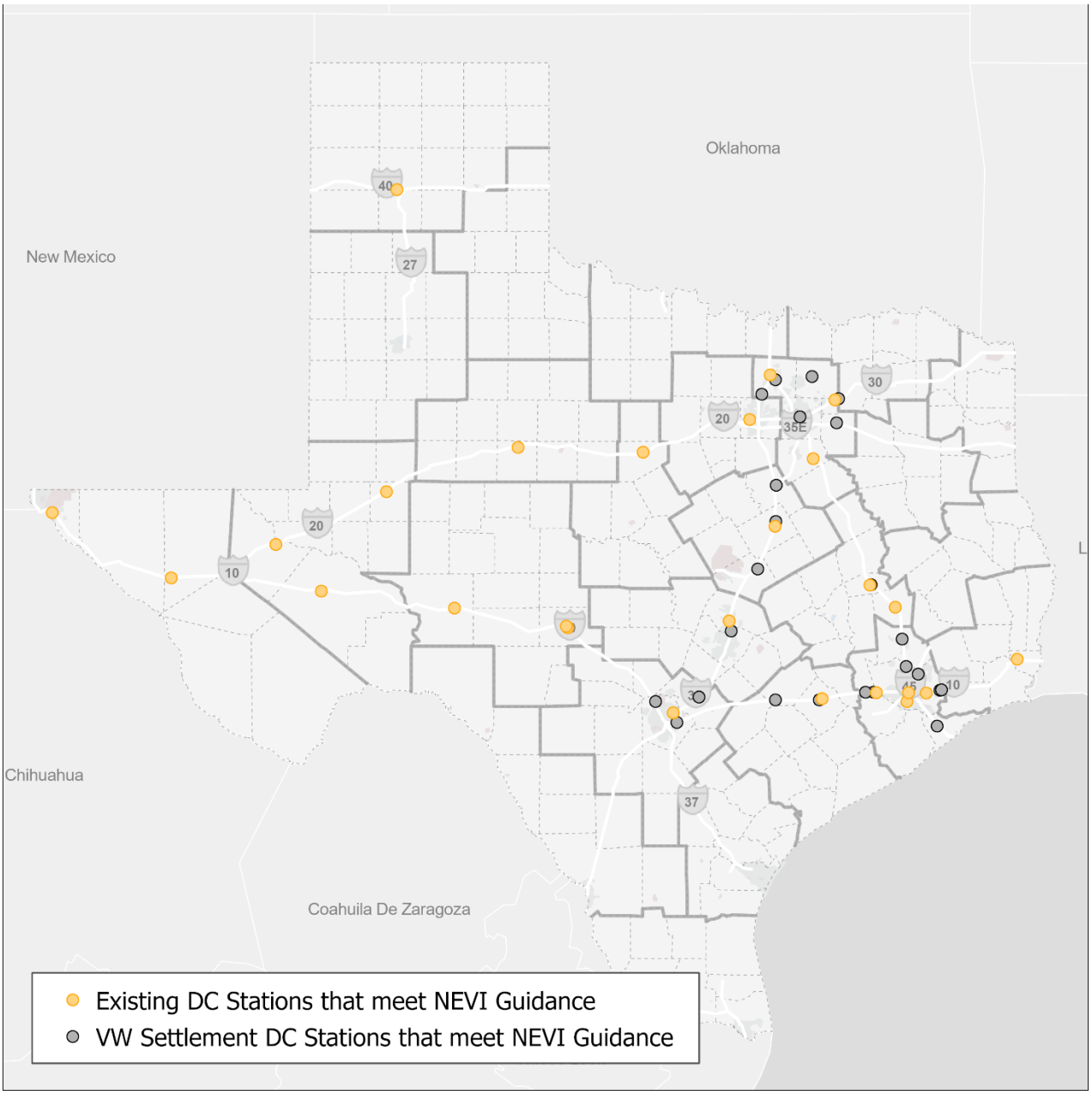
ID	Level	Route	Latitude	Longitude	Plugs	EV Network
121817	DCFC	IH0040-KG	35.185169	-101.940833	4	Electrify America
121829	DCFC	IH0035-KG	33.231573	-97.168083	6	Electrify America
121834	DCFC	IH0020-KG	32.403314	-98.792891	4	Electrify America
121840	DCFC	IH0045-KG	30.714547	-95.569776	4	Electrify America
121841	DCFC	IH0035-KG	30.566381	-97.691596	10	Electrify America
121842	DCFC	IH0010-KG	30.491826	-99.753775	4	Electrify America
121849	DCFC	IH0010-KG	29.708349	-96.504324	4	Electrify America
122241	DCFC	IH0035-KG	31.60057	-97.105852	6	Electrify America
122600	DCFC	IH0010-KG	31.75124	-106.341503	4	Electrify America
122652	DCFC	IH0020-KG	32.452939	-100.393829	4	Electrify America
123054	DCFC	IH0010-KG	30.143099	-94.012908	4	Electrify America
123484	DCFC	IH0010-KG	31.040115	-104.823968	4	Electrify America
123638	DCFC	IH0010-KG	30.894987	-102.907409	4	Electrify America
123687	DCFC	IH0020-KG	31.974518	-102.072571	4	Electrify America
124686	DCFC	IH0010-KG	29.769435	-95.176436	6	Electrify America
127441	DCFC	IH0045-KG	30.956893	-95.895882	4	Electrify America
127935	DCFC	IH0030-KG	32.964816	-96.342516	4	Electrify America
133327	DCFC	IH0045-KG	32.332069	-96.620116	4	Electrify America
134004	DCFC	IH0010-KG	29.772613	-95.399876	6	Electrify America
145373	DCFC	IH0020-KG	31.402787	-103.484656	4	Electrify America
170246	DCFC	IH0010-KG	30.706702	-101.205709	4	Electrify America
170512	DCFC	IH0010-KG	29.775785	-95.810792	4	Electrify America

Additional DC Fast Charge stations are under development using VW Settlement funds administered by TCEQ. While not deployed yet, they will meet FHWA requirements for quantity, power level, and distance from exits on Electric Alternative Fuel Corridors. Therefore, we considered them when determining new locations along Alternative Fuel Corridors.

VW Settlement DC Fast Charge Stations as of April 6, 2022:

Contract ID	Level	Route	Latitude	Longitude	Plugs	Network
582-22-32339-VW	DCFC	IH0035-KG	32.04545815	-97.09077127	4	TBD
582-22-32340-VW	DCFC	IH0045-KG	32.78320073	-96.78692011	4	TBD
582-22-32096-VW	DCFC	IH0035-KG	31.65067093	-97.0989728	4	TBD
582-22-32341-VW	DCFC	IH0010-KG	29.80084788	-94.9999238	6	TBD
582-22-32490-VW	DCFC	IH0045-KG	30.96554184	-95.88057272	6	TBD
582-22-32240-VW	DCFC	IH0030-KG	32.97918486	-96.29529893	6	TBD
582-22-32241-VW	DCFC	IH0010-KG	29.77908038	-95.84572843	6	TBD
582-22-32343-VW	DCFC	IH0035W-KG	33.02437666	-97.27802603	6	TBD
582-22-32344-VW	DCFC	IH0020-KG	32.71680454	-96.321195	6	TBD
582-22-32345-VW	DCFC	IH0035-KG	31.13640155	-97.3291671	6	TBD
582-22-32346-VW	DCFC	IH0010-KG	29.44352921	-98.36129103	4	TBD
582-22-32285-VW	DCFC	IH0035-KG	29.72699233	-98.07891268	6	TBD
582-22-32286-VW	DCFC	IH0035E-KG	33.17917046	-97.10161686	6	TBD
582-22-32034-VW	DCFC	IH0045-KG	30.96467007	-95.88425764	4	TBD
582-22-32098-VW	DCFC	IH0045-KG	30.36694123	-95.48392646	4	TBD
582-22-32099-VW	DCFC	IH0045-KG	29.40187936	-95.0333429	4	TBD
582-22-32100-VW	DCFC	IH0035-KG	30.45656862	-97.66792003	4	TBD
582-22-32153-VW	DCFC	IH0010-KG	29.67629861	-98.63458553	4	TBD
582-22-32035-VW	DCFC	IH0010-KG	29.7778568	-95.95186611	4	TBD
582-22-32243-VW	DCFC	IH0010-KG	29.69532848	-97.10342963	4	TBD
582-22-32244-VW	DCFC	IH0069-KG	29.98137796	-95.2760761	4	TBD
582-22-32245-VW	DCFC	IH0010-KG	29.69379236	-96.539667	4	TBD
582-22-32348-VW	DCFC	IH0010-KG	30.50909936	-99.77284623	4	TBD
582-22-32037-VW	DCFC	IH0010-KG	29.80395297	-94.98131383	4	TBD
582-22-32039-VW	DCFC	IH0045-KG	30.06581275	-95.43345066	4	TBD

Existing DC Fast Charge and VW Settlement locations that meet NEVI requirements:



Known Risks and Challenges

TxDOT began tracking the development of DC Fast Charge stations in Texas on February 10, 2022. Existing stations that met FHWA guidance were combined with planned stations from the VW Settlement funds administered by the Texas Commission on Environmental Quality. Gaps were identified and candidate locations were proposed that meet FHWA guidance. It is anticipated that TxDOT will be able to meet or exceed requirements for DC Fast Charge station spacing and power ratings. Any deficiencies along the corridors will be documented in the Discretionary section of this plan. TxDOT will rapidly re-evaluate the network to assess impacts of private sector non-NEVI stations added to highways that meet FHWA guidance and refine candidate locations accordingly. This will allow TxDOT to better fund other areas and increase the overall density of the charging network.

The ongoing equipment, labor, precious metals, and microchip shortages have the potential to lengthen timelines and limit private sector capabilities. TxDOT acknowledges the difficulties brought on by these situations and will do our best to work with vendors and planning partners to complete the network as soon as possible.

EV Charging Infrastructure Deployment

TxDOT will partner with the private sector to develop the EV Charging Network. Per FHWA guidance the plan will start with the Electric Alternative Fuel Corridors then work with rural/small urban areas and MPOs across the state. Non-Alternative Fuel Corridors will be ranked by VMT and developed in succession. County Seats will be the primary focus in rural areas with DC Fast Charge stations and MPOs will install a combination of DC and Level II stations determined by the MPOs.

Typical specifications for Electric Alternative Fuel Corridor and Rural County Seat locations:

- CCS Connector (industry standard)
- 150-350kW Max Power (higher power acceptable assuming costs are not prohibitive)
    - 400-800 volts, 150-600 amps, 3 phase
- 45-minute time limit
- Any shared circuits provide a minimum of 150kW per vehicle
- Idle fee after charging complete/time limit exceeded
- Minimum 4 DC Fast Charge units per station
- Max 8 units per station
- Pull through spaces for vehicles with trailers
- 15-foot charge cable length (need to verify this length is acceptable)
- Open 24/7 and Publicly Available
- Adequate lighting, restrooms, ADA compliant
- Plug to Charge Preferred (payment handled by vehicle when plugging in) payments by phone/app/card will also be acceptable
- Spaces Marked EV Only
- Signs recommending charging to 80%
- Station location, operational status, and cost/fees published online
- Vendor required to make usage data per location available to TxDOT every 6 months
- Signage directing users to charging locations

After Electric Alternative Fuel Corridors are built out TxDOT will balance the rollout of the network between urban and rural areas splitting funds per year on a 50/50 basis.

Typical specifications for Level II charging (useful inside MPOs for retail/workplace charging)

- J1772 Connector (industry standard)
- 6-10 kW Max Power
    - 240 volts, 15-50 amps, single phase
- Same requirements for signage, markings, and plug to charge capability as DC Fast Charging

Funding Sources

TxDOT will develop a program where third parties fund the non-federal share of the NEVI Formula Program. Operations and Maintenance funds will be available for the first five years of station operations for select locations (typically rural). Third parties will collect fees from station operation and be responsible for maintenance going forward.

Estimated cost to develop an EV Charging Network in Texas:

Description	Locations	DC Fast*	Level II	Federal	Private Sector	5 YR Operations & Maintenance (Fed)
Alt Fuel Corridors	47	272	0	$32.64M	$8.16M	$10.2M
County Seats	190	1,014	0	$121.68M	$30.2M	$37.97M
Inside MPOs**	TBD	1,274	19,860	$163M	$32.6M	$40.75M
Total		2,560	19,860	$317.32M	$101.58M	$88.92M

* 150kW minimum on Alt Fuel Corridors and County Seats, could vary based on situation, estimated at $150K per unit.

**MPOs will propose the quantity of DC or Level II stations in their areas up to the target dollar amount, estimate for DC stations inside MPOs is 50K per unit at 50kW max power, Level II is estimated at 5K per unit at 10kW max power.

2022 Infrastructure Deployments/Upgrades

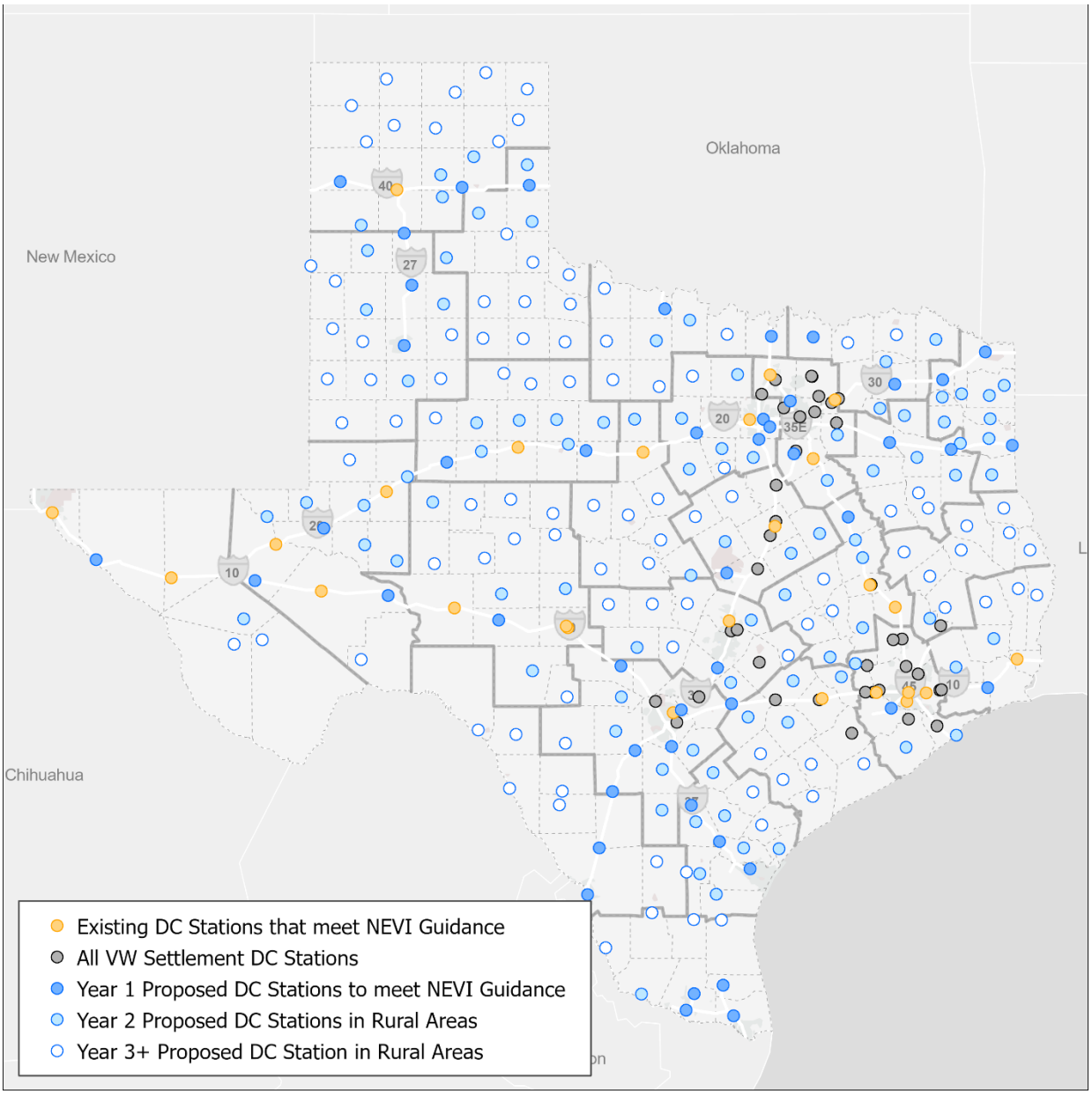
For Electric Alternative Fuel Corridors, TxDOT examined existing charging locations using the Alternative Fuel Data Center and applied round 6 requirements to identify stations that met requirements. TCEQ planned locations were examined and filtered by round 6 requirements as well. Resulting coverage gaps greater than 50 miles were examined for suitable electrical supply and candidate locations were placed near communities or incorporated cities.

After Alternative Fuel Corridors are complete the focus will shift to rural areas and MPOs. County seats will be the location of choice for DC Fast Charge stations in rural areas due to their central location in the region. County seats along the gulf coast will have more units per location to assist with peak demand during evacuation scenarios. Larger cities and MPOs without interstate access will also have more units per location.

List of Stations

The following DC Fast Charge stations deployment map depicts general locations along Alternative Fuel Corridors and County Seats. Orange dots represent existing DC Fast Charge stations that meet round 6 requirements. Dark Blue dots represent proposed charging locations that meet round 6 requirements on the Electric Alternative Fuel Corridors. Dark Gray dots represent planned charging locations from the VW settlement funds administered by TCEQ. Light Blue and White dots represent proposed DC Fast Charge locations at County Seats. Stations inside MPOs will be determined after Electric Alternative Fuel Corridors are built out.

*See appendix for full list of stations



Estimates for EV Charging inside MPOs – Activities inside MPOs would begin after building out Electric Alternative Fuel Corridors. (This section is draft and may change. FHWA has not provided the details or mechanism for working with MPOs, preference will be toward maximizing resources for installation).

ID	MPO Name	Installation	5 YR Operations & Maintenance
1	Abilene MPO	$823,070	$205,767
2	Alamo Area MPO	$14,784,236	$3,696,059
3	Amarillo MPO	$1,562,037	$390,509
4	Bryan-College Station MPO	$1,291,464	$322,866
5	CAMPO	$19,726,574	$4,931,643
6	Corpus Christi MPO	$1,909,412	$477,353
7	El Paso MPO	$4,352,726	$1,088,182
8	Grayson County MPO	$1,317,322	$329,330
9	HGAC	$41,740,542	$10,435,135
10	Killeen-Temple MPO	$2,499,501	$624,875
11	Laredo Webb County Area MPO	$1,143,499	$285,875
12	Longview MPO	$854,180	$213,545
13	Lubbock MPO	$1,598,879	$399,720
14	North Central Texas COG	$51,843,135	$12,960,784
15	Permian Basin MPO	$2,060,291	$515,073
16	Rio Grande Valley MPO	$6,831,699	$1,707,925
17	San Angelo MPO	$590,289	$147,572
18	South East Texas RPC	$2,691,610	$672,902
19	Texarkana MPO	$481,485	$104,621
20	Tyler MPO	$1,562,864	$390,716
21	Victoria MPO	$773,592	$193,398
22	Waco MPO	$1,986,021	$496,505
23	Wichita Falls MPO	$638,574	$159,643

Estimates are based on a modified Category 2 formula from TxDOT's Unified Transportation Program. Total Federal dollar estimates do not include 20% 3rd party contribution. Each attribute percentage is calculated based on the sum (inside MPOs) of each attribute. The attributes are 2020 Population, 2020 Vehicle Mile Traveled, Lane Miles, and EV Ownership.

Formula (each attribute divided by sum (inside MPOs) and converted to percent, then averaged)**:**

(MPO POP/POP)*100 + (MPO VMT/VMT)*100 + (MPO LM/LM) + (MPO EV/EV)*100 / 4 = MPO %

Abilene Example:

(113449/25617630)*100 + (2775942/555360389)*100 + (2547/309446)*100 + (84/47807)*100 / 4 = .50

.50 * $203.75M = $1,028,837 ($823,070 for installation, $205,767 five years of O&M)

Energy Usage Estimates

Estimating energy usage is difficult since owners do not charge their cars at the same time and vehicles do not charge at the same rate throughout a battery charging cycle.

Realistically, electric vehicles cannot sustain a high charge rate over the entire session. Batteries with a low state of charge will accept the high rate for a few minutes then start tapering down as battery pack voltage increases. However, it is easy to estimate a theoretical max usage scenario for illustration purposes.

The following table displays estimates for theoretical max power consumption by area and type.

Area	Type	Max Per Unit (KW)	Units	Est. Max Power (MW)
Alt Fuel Corridors (50%)	DC Fast	150	137	20.55
Alt Fuel Corridors (35%)	DC Fast	250	95	23.75
Alt Fuel Corridors (15%)	DC Fast	350	40	14
Near County Seats (80%)	DC Fast	150	811	121.65
Near County Seats (15%)	DC Fast	250	152	38
Near County Seats (5%)	DC Fast	350	50	17.5
Inside MPOs (50%)	DC Fast	50	637	31.85
Inside MPOs (25%)	DC Fast	150	318	47.7
Inside MPOs (15%)	DC Fast	250	191	47.75
Inside MPOs (10%)	DC Fast	350	127	44.45
Inside MPOs	Level II	10	19,860	198.6
Totals			22,418	605.8

In summary, if all DC and Level II charging stations in this plan were utilized at the same time at their max rate, they would consume 605.8 MW of electricity from the grid. The Electric Reliability Council of Texas hosts an assortment of dashboards displaying near real time grid conditions. On May 3rd Operating Reserves ranged from 3,751 MW to 6,066 MW. The potential impact on the overall statewide grid appears minimal for the type and quantity of EV Chargers outlined in this plan.

Upgrades of Corridor Pending Designations to Corridor Ready Designations

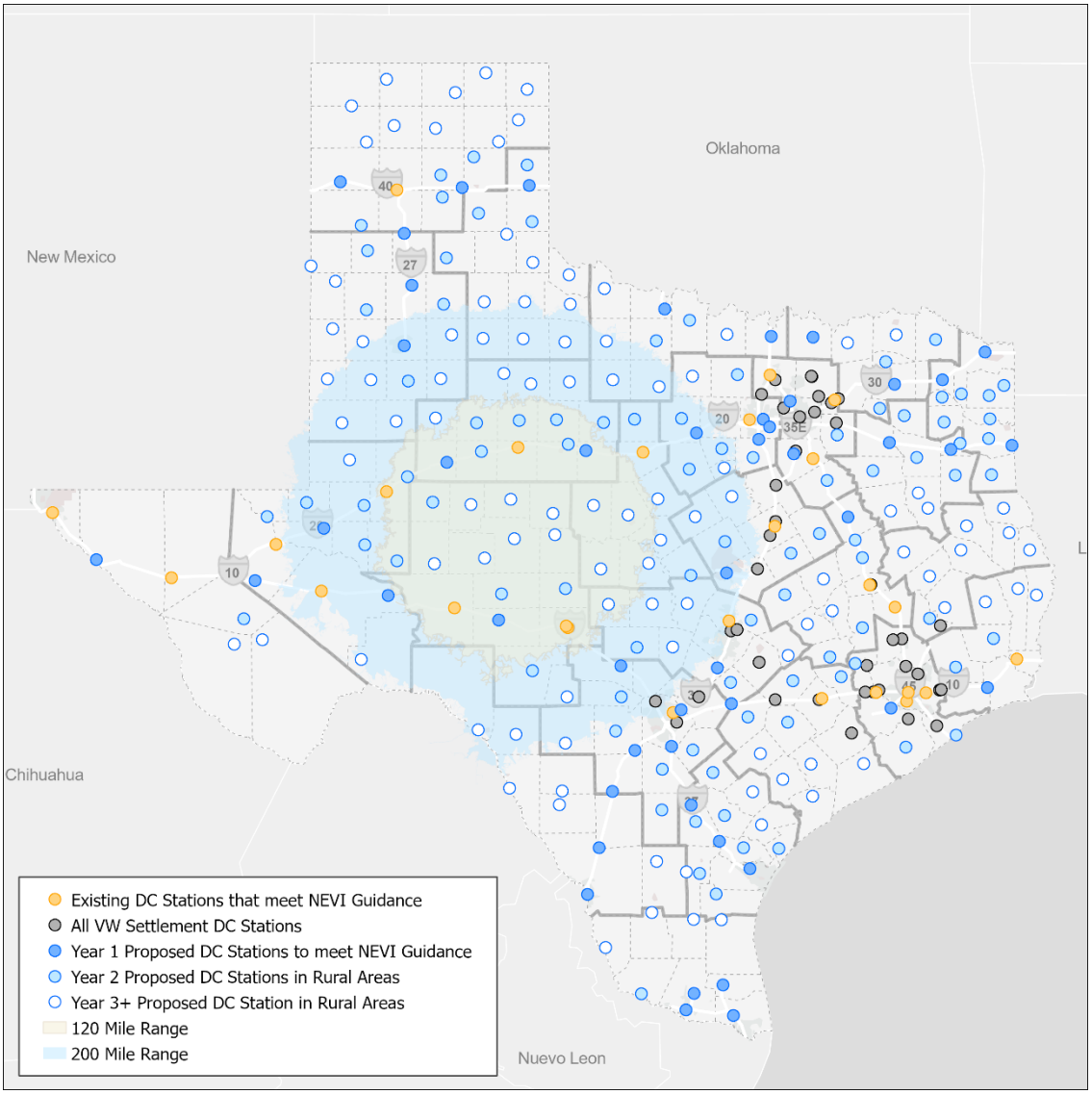
TxDOT elected to nominate missing non-business Interstate routes to the Electric Alternative Fuel Corridors as pending segments. This was done in anticipation of cities, counties, and other municipal entities pursuing grant funds as part of the $2.5B program. Expanding the corridors to all Interstate routes also connected as many MPOs as possible across the state. It should be noted that San Angelo, Bryan-College Station, and Victoria MPOs are not on Interstate routes. TxDOT was careful not to nominate too many segments to the Electric Vehicle Corridors due to the FHWA requirement to finish the corridors before spending funds on other roadways.

Increases of Capacity/Redundancy along Existing AFC

TxDOT applied FHWA guidance for station spacing, power ratings and number of units to the Alternative Fuel Corridors. We evaluated the estimated range of an 80% charge from a 30-minute charge session for low and mid-range electric vehicles.

On the low end, a 150-mile range electric vehicle would have an estimated 120-mile range after completing an 80% charge. A 250-mile mid-range electric vehicle would have an estimated 200-mile range after completing an 80% charge. Resulting range from a recommended 80% charge would provide EV drivers ample options to traverse the state when the network is fully built out.

The following map depicts an estimated range of 120 miles and 200 miles resulting from an 80% charge at a proposed DC Fast Charge station in San Angelo. It is clear from the estimated range map that users of the network would have numerous options for traveling across the state.



Minutes to Charge for 100 Miles of Range:

	Tesla Model 3	Nissan LEAF	Ford Mustang Mach-E	Volvo XC40 Recharge	Rivian R1T
Level I	1,080	1,400	1,560	1,720	2,040
Level II	135	175	195	215	255
DC 50kW	35	42	47	52	61
DC 150kW	11	14	16	17	20
DC 350kW	5	6	7	7	9

Source: Grid Integration of EV Charging Infrastructure: A Workshop to Share Knowledge between the Grid Industry and States (NASEO GridWise Alliance) 3/14/2022.

It should be noted that none of the vehicles in this list will support a charge rate of 350kW. At present no electric vehicles on the market can sustain a charge rate of 350kW.

Electric Vehicle Freight Considerations

TxDOT will address freight following the release of FHWA guidance in the fall of 2022.

Public Transportation Considerations

Transit agencies in the metropolitan areas of Texas have already deployed electric buses through grants received through the FTA Low or No Emission Vehicle Program and plan to increase the number of electric buses in the future. Dallas Area Rapid Transit currently has seven transit buses and will purchase up to 10 more electric buses before the end of FY 2024. Trinity Metro, which serves Tarrant County in North Texas, has six transit buses and plans to add eight more electric buses in the future. STAR Transit, a smaller transit provider in the Dallas-Fort Worth area, will deploy eight electric transit vehicles in 2023-2024 with funds received through the Rebuilding American Infrastructure with Sustainability and Equity Grant program.

FY23-26 Infrastructure Deployments

TxDOT will concentrate on the Alternative Fuel Corridors first then move to County Seats and MPOs. The following table outlines approximate years for each region and charging type. This is an early estimate and subject to change going forward. Additional FY would be added until funds are expended.

Year	Description	Locations	DC Fast Units	Level II Units
FY 2023	Alt Fuel Corridors	47	272	0
FY 2024	MPO	TBD	424	6,620
FY 2024	County Seats	63	338	0
FY 2025	MPO	TBD	424	6,620
FY 2025	County Seats	63	338	0
FY 2026	MPO	TBD	424	6,620
FY 2026	County Seats	63	338	0

State, Regional, and Local Policy

The EV Plan will rely on third party entities to coordinate with local property owners and municipalities on zoning and permitting. Discussions with equipment providers during the development of the EV Plan demonstrated third party providers were well equipped to handle these tasks as part of their normal business practices. TxDOT will monitor developments at the state and local level during the implementation of this plan and provide updates to state and local officials when requested.

Implementation

Strategies for EVSE Operations & Maintenance

Vendors receiving awards will follow agreed-upon requirements for operation and maintenance. Monitoring and service level agreements for station performance will be specified in the contract and TxDOT will monitor station up time through vendor reported usage data and general user satisfaction on publicly accessible third-party charging web sites. Operation and maintenance costs were estimated at 5% of installation cost and will be evaluated per location over time. Enforcement of idle fees and time limits will be the responsibility of the vendor/station operator.

Strategies for Identifying Electric Vehicle Charger Service Providers and Station Owners

TxDOT will use existing solicitation methods to advertise, select, and award contracts to electric vehicle charging equipment service providers/property owners. As part of the discovery process for EV plan development, it became clear charging equipment companies have the expertise and ability to locate suitable locations for charging stations within TxDOT's recommended EV study areas. TxDOT will monitor progress with regular meetings between the vendor and project team as spelled out in the contract.

Strategies for EVSE Data Collection & Sharing

Contracts with vendors will include requirements to provide anonymized 6-month usage for analysis. Data and trends from charging station usage will be published on the Statewide Planning Map, and ArcGIS Online dashboards like the EV Dashboard published during EV Plan creation. Usage data will also be available on TxDOT's Open Data Portal for visualization or analysis by the public, researchers, or other interested parties.

Strategies to Address Resilience, Emergency Evacuation, Snow Removal/Seasonal Needs

As stated earlier, charging stations need to be reliable for continued travel, and ready to help the public evacuate from extreme conditions. We will include considerations to address extreme weather, infrastructure degradations, and cyber and physical security. We will explore and establish readiness capabilities to mitigate these risks. It starts with placing charging stations in suitable locations near interchanges and crossroads that are easily accessible, near commercial or public sites, and with adequate physical and cyber security, communications systems, and power aligned to priority grid capabilities. Beyond that, there are several developing capabilities which we will assess and implement when proven capable and needed.

There is a fledgling industry for mobile EV charging for these types of events. AAA currently offers this service to EV drivers in states such as Oregon and Colorado, where it has installed a large battery with Level II or DC Fast Charge capability on a truck. Similarly, Tesla installed super chargers on semi-truck trailers to provide surge capacity at high volume stations, a strategy that state DOTs could adopt in the future to assist motorists during emergency evacuation events.

There are also companies such as Ample Technologies that are pioneering modular, building-block-style EV battery technology that allows batteries to be changed in minutes and can accommodate any make, design, model, or driving profile. With a small footprint equivalent to two parking spots, they can be located at gas stations, grocery stores, or the side of the road on an evacuation route.

Strategies to Promote Strong Labor, Safety, Training, and Installation Standards

TxDOT expects vendors selected under this program to emphasize safety in all aspects of station development, installation, and maintenance. Various programs are available to ensure local contractors are knowledgeable and trained on the subject and the selected vendor is expected to take advantage of those resources. TxDOT will add training and certification criteria to the scoring matrix for vendor evaluation in the solicitation process.

Certification programs for EV Charging equipment

https://evitp.org/

Civil Rights

All proposed planned guidelines and recommendations for the deployment of Electric Vehicle (EV) charging stations will be created pursuant to all federal, state, and local laws, regulations, and statutes to ensure compliance with the Americans with Disabilities Act (ADA) and Title VI of the Civil Rights Act of 1964 (Title VI). The ADA prohibits discrimination against persons with qualified disabilities regarding the usability and/or participation of all programs, services, activities, or benefits offered by TxDOT. TxDOT ensures that no person in the United States shall, on the grounds of race, color, or national origin, be excluded from participation in, be denied the benefits of, or otherwise be subjected to discrimination under any program or activity.

To support the assurances provided by the Executive Director of the agency, the following steps should be integral to the deployment and plan:

To comply with the ADA -

1. TxDOT will develop EV charging stations in accordance with ADA standards related to accessible parking spaces, including but not limited to Public Right-of Way Accessibility Guidelines (PROWAG) and Texas Department of Licensing and Registration (TDLR) guidelines.
2. TxDOT will follow the procedures based on the swim lane outlined in the ADA Transition Plan.
3. Procedures require signature authorization outlined in the ADA Transition Plan.
4. Recommend that TxDOT's Design Division (DES) leads the ADA compliance effort as it has with the design of curb ramps, sidewalks, and other accessibility requirements.
5. Public outreach events must be held in accordance with Section 504 of the Rehabilitation Act of 1973 (as amended) to generate public feedback from the disability community.
6. Recommend that the EV charging stations be included in the State Transportation Planning Map and included in the ADA "living" Transition Plan (Web App Viewer Tool).

To comply with Title VI -

1. Develop and complete an environmental checklist to meet the Environmental Justice requirements.
2. TxDOT provides training to districts/division personnel regarding EV charging stations.
3. Educate the public regarding the availability of EV charging stations.
4. Conduct necessary public outreach events providing translation and interpretation services as needed to generate public feedback.

Any construction using federal funds will require the utilization of Disadvantaged Business Enterprises.

Equity Considerations

Identification and Outreach to (DACs) in the State

TxDOT and the state are committed to addressing not only initial EV range anxiety, but to enabling EV growth across the state regardless of location, demographics or economic levels. Not surprisingly, initial EV growth in the state is largely in urban areas and related to areas with greater wealth, directly correlating with the high prices of initial EVs and the early needs to charge them at home or access limited charging sites. As the vehicle industry grows, and the models and prices decrease, we expect more overall affordability and access to passenger and light truck vehicles, either through direct ownership or shared vehicle services. As cities and metro regions commit local resources and are awarded grants, they will also be able to support transit fleets and local delivery freight.

Texas is aware some of its communities do not have sufficient resources or experience with EV and need both to improve their opportunities and access to their benefits. With the NEVI funding, we are equitably planning for EV charging capabilities between our rural and urban areas. Texas has extensive rural regions not only in the western half of the state, but also along the Texas-Mexico border, and areas along our borders with Oklahoma, Arkansas and Louisiana. In the rural areas, we understand the initial densities of EVs may be lower but must ensure that the infrastructure reliably enables the long-range travel common in those areas as well as provide assurance that initial charging infrastructure is sufficiently nearby to supplement charging for local needs. To address this, approximately half of the NEVI formula funding for Texas is for proposed locations in rural areas. In addition to the charging stations along our alternate fuel corridors, which are through many of our rural areas, we have proposed charging stations near every county seat in the state. Those locations are at the crossroads of every county and are strong opportunities to support those areas with initial capabilities. This also ensures an expected common level of capability in every county. We will be hosting public outreach for counties and the communities they represent prior to plan submission, to validate this approach and will continue to plan and coordinate the siting and operations with the counties as we begin contracting and execution. We are following a similar approach in the urban areas. We start by using formulas to plan allocations according to similar approaches used in our infrastructure planning and accepted by our MPOs. This will allocate approximately half of the NEVI formula funding for Texas. We are engaging the MPOs to collaborate with all their communities and develop local needs, that recognize already existing infrastructure and focus on where needs aren't addressed in underserved areas. In both our rural and urban areas, we will develop those plans with local leaders informed by their communities. Outreach to communities will occur through TxDOT Social Media channels and invitations to community leaders to attend statewide planning and coordination meetings with local governments during site selection and rollout. As we contract for capabilities, we will require the selected vendor to review, evaluate, and site locations within the TxDOT EV Study Area using federal requirements and guidelines made available by the Joint DOT/DOE office.

Process to Identify, Quantify, and Measure Benefits to DACs

TxDOT is experienced with measuring performance and reporting according to FHWA requirements. We recognize the value of performance-based planning and decision-making. As stated above, TxDOT and the state are committed to addressing not only initial EV range anxiety, but to enabling EV growth across the state regardless of location or economic levels. We anticipate the Joint DOE/DOT office or FHWA will establish national standards for measuring the benefits to the public such as air quality or job creation. In the meantime, there are examples from industry, other states, and current practices that we'll adapt to begin to internally track, measure and assess our performance through the lifecycle of managing the EV program.

Benefits to DACs through this Plan

TxDOT acknowledges there may be initial difficulties measuring direct or indirect benefits in this plan. As mentioned earlier, we anticipate the Joint DOE/DOT office or FHWA will establish national standards for measuring the benefits. For example, installing charging stations in disadvantaged communities in both rural and urban areas does little for households with low vehicle ownership rates. However, the presence of charging stations could increase access to locally owned businesses while travelers charge their vehicles, providing additional income to local economies that can translate to overall growth in prosperity and wealth. Further indirect benefits shared by the greater community would be improved air quality due to zero mobile emission rates of electric vehicles. Finally, as electric vehicles become more available to all, access to charging stations will present decreased cost of ownership and operation.

Labor and Workforce Considerations

Texas is quickly becoming a hub of innovation and activity for the EV workforce. On December 1, 2021, Tesla relocated its corporate headquarters to its "Gigafactory Texas" just outside of Austin. As the largest EV vehicle manufacturer in the world and one of the largest owners of charging infrastructure, Tesla's presence in Central Texas has already begun to attract related sectors and corollary activities such as charging infrastructure.

But even prior to Tesla's arrival, Texas had already begun to ramp up its EV workforce. The Texas Advanced Energy Business Alliance (TAEBA) reported that Texas had 48,800 jobs in advanced electricity generation (i.e., solar, bioenergy, natural gas, wind, and nuclear power), 13,200 jobs in advanced grid and energy storage (i.e., battery storage, microgrid, and other grid technologies), 17,300 jobs in advanced vehicles (i.e., hybrid, electric, natural gas, and fuel cell vehicles).[1] More specifically, TAEBA reports that the electric transportation sector specifically employed more than 7,000 workers in more than 1,200 companies across the state in 2019. The number of workers is expected to grow to over 13,000 workers by 2024, and there are more than 5,000 Texas companies and more than 400,000 Texans in industries that could directly benefit from growth in the electric transportation sector.[2] Throughout the NEVI Formula Program, TxDOT expects the capacity of Texas' EV-related workforce to expand greatly and supply TxDOT with increasingly more and better providers to contract work with.

In support of TxDOT's Equal Employment Opportunity (EEO) Policy Statement, Affirmative Action Plan, and its ongoing commitment to integrating diversity, equity, and inclusion throughout all levels of the agency, TxDOT has a long history of contracting with federally identified disadvantaged business enterprises (DBEs) as either prime providers or subcontractors. TxDOT will require each proposal for a NEVI contract to submit a DBE Performance Plan as part of a responsive proposal.

[1] TAEBA, Advanced Energy Jobs in Texas 2020, at https://www.texasadvancedenergy.org/hubfs/TX-Fact-Sheet-2020-TAEBA.pdf.

[2] TAEBA, Electric Transportation Supply Chain in Texas, at https://info.aee.net/hubfs/TAEBA/TAEBA-TX-Supply%20Chain-Study-2020.pdf.

Cybersecurity

TxDOT is committed to ensuring that critical infrastructure transportation technologies of the future, including Electric Vehicle Charging Networks, do not pose a cybersecurity or personal privacy risk to Texas or the United States. Third parties contracted will own, operate, and maintain the EV charging stations as well as the data produced. They will be required to provide TxDOT anonymized data on a recurring basis. Third Parties will also be required to publish station location, power ratings, and costs to the various sites tracking EV charging stations, including the US Department of Energy Alternative Fuel Data Center.

As part of the contract, prior to issuance of the award or other funding, the third party will be required to provide a cybersecurity plan that demonstrates the cybersecurity maturity of the recipient and it's compliance with applicable Texas, regulatory, and Federal cybersecurity requirements. The plan must also demonstrate how the recipient will maintain and improve cybersecurity throughout the life of the proposed solution. This will include requirements to maintain compliance with current and future cybersecurity requirements as well as alerting TxDOT and the Cybersecurity and Infrastructure Security Agency (CISA) of any known or suspected network or system compromises. At the end of the project the third party must provide evidence that the cybersecurity plan was properly implemented.

Program Evaluation

Using tools developed to draft the EV plan, TxDOT will re-evaluate the network on an annual basis. This includes monitoring private sector development, examining usage data returned from installed equipment, and working with our planning partners to develop new locations and make necessary adjustments to existing locations.

Charging statistics and summaries will be included in the annual roadway inventory report found on TxDOT's website. Charging locations will be found in the departments Statewide Planning Map, and the EV Dashboard will continue tracking charging stations with weekly data updates from the Alternative Fuel Data Center.

Discretionary Exceptions

TxDOT will document exceptions for DC Fast Charge stations that cannot meet FHWA requirements. At the time of this draft, TxDOT does not anticipate any issues meeting FHWA requirements for DC Fast Charge stations on the Electric Alternative Fuel Corridors. Any potential issues with placement, utilities, communications, or security for stations in rural areas of Texas will be communicated and coordinated with FHWA as the program develops.

Appendix

EV Charging Infrastructure Development

List of proposed stations outside MPOs FY22-FY26

Truncated table below, will attach as pdf to final document (don't want to make web doc unstable)

ID	Level	Corridor	Name	Latitude	Longitude	Plugs
1	DCFC	Corridor Pending	Adrian	35.26967756	-102.6649814	4
2	DCFC	Corridor Pending	Groom	35.21211293	-101.1050043	4
3	DCFC	Corridor Pending	Shamrock	35.23116369	-100.246426	4
4	DCFC	None	Happy	34.73051337	-101.8477064	4
5	DCFC	None	Plainview	34.18394316	-101.7499367	4
6	DCFC	Corridor Pending	Sulphur Springs	33.13495702	-95.57412828	4
7	DCFC	Corridor Pending	Mt Pleasant	33.18137715	-94.96201725	4
8	DCFC	Corridor Pending	New Boston	33.47512717	-94.41747346	4
9	DCFC	Corridor Pending	Van	32.50681783	-95.64429171	4
10	DCFC	Corridor Pending	Rolling Meadows	32.4332023	-94.85378602	4
11	DCFC	Corridor Pending	Waskom	32.4761052	-94.07648992	4
12	DCFC	Corridor Pending		32.61068728	-98.10999446	8
13	DCFC	Corridor Pending	Clyde	32.41805083	-99.52424242	4
14	DCFC	Corridor Pending	Coahoma	32.29338398	-101.3029915	4
15	DCFC	Corridor Pending	Monahans	31.5803503	-102.8743185	4
16	DCFC	Corridor Pending	Fort Hancock	31.23666143	-105.7861962	4
17	DCFC	Corridor Pending	Iraan	30.84439266	-102.0506411	4
18	DCFC	Corridor Pending	Sonora	30.57671656	-100.6374066	4
19	DCFC	Corridor Pending	Balmorhea	31.00929666	-103.7522149	4
20	DCFC	Corridor Pending	Fairfield	31.70057873	-96.17160137	4
21	DCFC	Corridor Pending	Winnie	29.82898655	-94.38919975	8
22	DCFC	Corridor Pending	Luling	29.6511992	-97.65959315	8
23	DCFC	Corridor Ready	Kerrville	30.0681395	-99.07594902	4
24	DCFC	Corridor Ready	Selma	29.58450014	-98.30539784	8
25	DCFC	Corridor Ready	Waxahachie	32.38584418	-96.86780908	8

Glossary of Terms

AC – Alternating Current

AFC – Alternative Fuel Corridor

CCS – Combined Charging System or plug type for DC Fast Charging

Corridor Pending – Corridor does not satisfy FHWA requirements

Corridor Ready – Corridor meets FHWA requirements

DC – Direct Current

DC Fast Charging – High power charging 400-800 volt, 150-600 amps, 3 phase

DOE – Department of Energy

DOT – US Department of Transportation

EV – Electric Vehicle

EVSE – Electric Vehicle Service Equipment

FHWA – Federal Highway Administration

Justice40 – Federal program outlining 40% of federal climate investments go directly to frontline communities most affected by poverty and pollution

kW – Kilowatt (1,000 watts)

kWH – Kilowatt Hour (1,000 watts for 1 hour)

Level I – Low power charging 120-volt, 10-20 amps, single phase

Level II – Medium power charging 240-volt, 15-50 amps, single phase

mW – Megawatt (1,000 kilowatts)

mWH – Megawatt Hour (1,000 kilowatts for 1 hour)

NEVI – National Electric Vehicle Infrastructure

PIP – Public Involvement Plan

SECO – State Energy Conservation Office

TCEQ – Texas Commission on Environmental Quality

TxDOT – Texas Department of Transportation

3 Phase – Electrical supply from 3 power lines